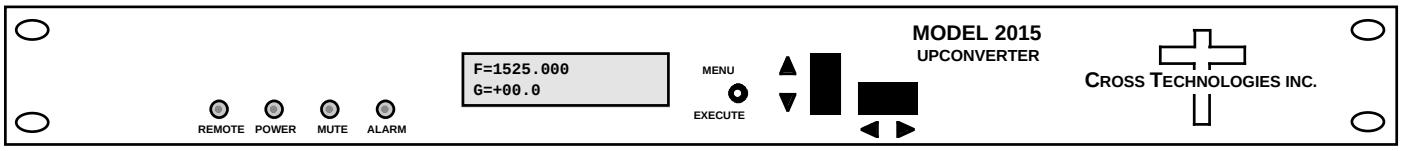
Instruction Manual

Model 2015-24
Upconverter

March 2010 Rev C



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CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

INSTRUCTION MANUAL

MODEL 2015-24 Upconverter

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MODEL 2015-24 Upconverter

1.0 General

1.1 Equipment Description

The 2015-24 L-band Upconverter converts 140 ± 36 MHz to 950 to 2150 MHz in 1kHz, 10kHz, 100kHz, or 125kHz steps (user selectable) with low group delay and flat frequency response. Synthesized local oscillators (LO) provide very low phase noise and ±0.01 ppm stability frequency selection. Multifunction push button switches select the RF frequency, gain, and other parameters. Front panel LEDs provide indication of DC power (green), PLL alarm (red), remote operation (yellow) or the TX carrier is muted (yellow). Variable attenuators for the IF input and output provide a gain range of -10 to +30 dB as adjusted by the front panel multifunction push-button switches. Remote operation allows selection of frequency and gain. Parameter selection and frequency and gain settings appear on the LCD display. Connectors are BNC (female) for IF and the optional external reference input and output, and Type F (female) for the RF output. SSPB +24 VDC, 2.5 Amps and 10 MHz reference can be inserted on the RF line as added options. The 10 MHz option also includes a 10 MHz output connector, which contains either the internal or external 10 MHz reference signal. The unit is powered by a 100-240 ±10% VAC power supply, and housed in a 1 3/4" X 19" X 16" rack mount chassis.

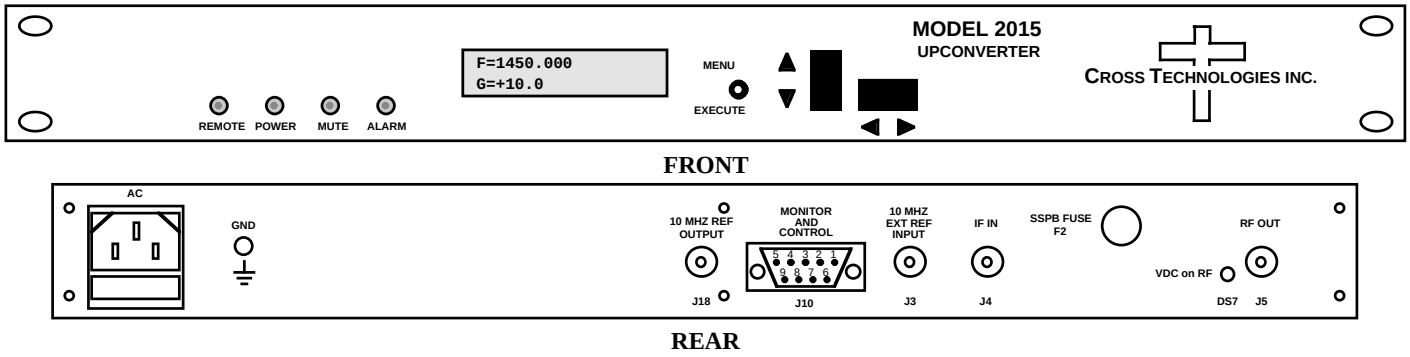


FIGURE 1.1 Model 2015-24 Front and Rear Panels

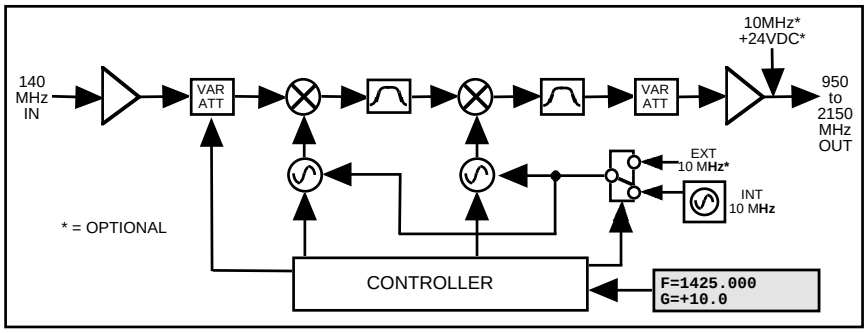


FIGURE 1.2 Model 2015-24 Upconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.1 2015-24 Upconverter Specifications*

Input Characteristics (IF)

Impedance	75 Ω
Return Loss	18 dB
Frequency	140 ± 36 MHz
Level	-40 to -10 dBm

Output Characteristics (RF)

Impedance	75 Ω
Return Loss	12 dB
Frequency	950 to 2150 MHz
Level	-20 to 0 dBm
1dB compression	+5 dBm

Channel Characteristics

Gain range	-10 to +30 dB (adjustable)
Frequency Response	±1.5 dB, 950-2150 MHz ; ± 0.5 dB, 72 MHz BW
Spurious Response	<-50 dBC
Group Delay, max	0.0035 ns/MHz^2, parabolic, 0.025 ns/MHz, linear, 1 ns ripple
Frequency Sense	Non-inverting

Synthesizer Characteristics

Frequency Accuracy	±0.01 ppm internal reference; external reference input
Frequency Step	1kHz, 10kHz, 100kHz, or 125kHz (user selectable)
10 MHz In/Out Level	+3 dBm ± 3 dB (**option E**)

Phase Noise @ Freq	100 Hz	1kHz	10kHz	100kHz	1MHz
dBC/Hz	-75	-85	-90	-110	-120

Controls, Indicators

Freq/Gain Selection	Direct readout LCD; pushbutton switches or remote selection
Power	Green LED
Alarm	Red LED
Mute	Yellow LED
Remote	Yellow LED
Remote	RS232C, 9600 baud (RS485, option Q)

Other

RF Connector	Type F (female)
IF Connector	BNC (female)
10 MHz Connectors	BNC (female), 50Ω/75Ω (option E)
Alarm/Remote Conn.	DB9 - NO or NC contact closure on Alarm
Size	19 inch, 1RU standard chassis 1.75”high X 16.0” deep
Power	100-240 ±10% VAC, 47-63 Hz, 45 watts max

Options

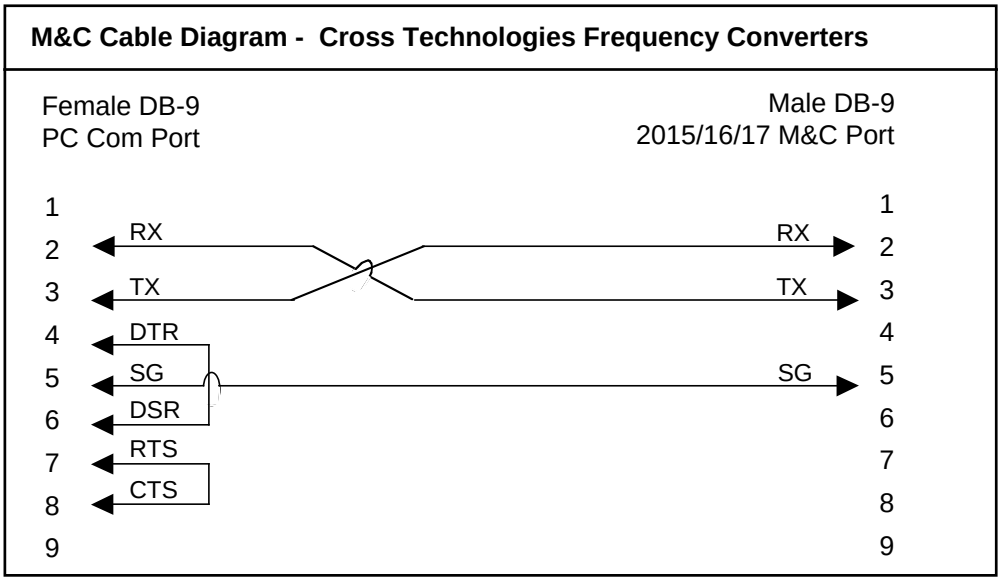
Available Options	See SECTION 2.6, page 18
Connector options	See TABLE 2.2, page 10

*+10˚C to +40˚C; Specifications subject to change without notice

1.3 Monitor and Control Interface

A) Remote Serial Interface

Protocol - RS-485, RS-422 or RS-232C (selectable), 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit.



Connector - Rear panel, DB-9 female

Pinouts (RS-485/422/232C)

Pin	Description
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	Ground
6	Alarm Relay - Common
7	Alarm Relay - Normally Open
8	Not Used
9	Alarm Relay - Normally Closed

B) Status Requests

Table 1.2 lists the status requests for the 2015-24 and briefly describes them.

*** PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.**

TABLE 1.1 2015-24 Status Requests		
Command	**Syntax ***	**Description**
Command Status	{aaS1}	Returns {aaS1bbbbbbbcccddAM} where:
		• bbbbbbb = Tx frequency in kHz (0950000 to 2150000)
		4 characters - standard (7 characters - Option-X)
		• ccc = Tx gain (-10 to 30 dB)
		• dd = Tx input level (10 to 40 => -10 to -40 dBm)
		• A = 0 - summary alarm
		• M = Tx RF Status (1 = Normal, 0 = Muted)
10 MHz Reference Status	{aaS2}	Returns {aaS2ER} where:
(option E ONLY)		• E = Ext 10MHz Status (1 = on, 0 = off)
		• R = 10MHz RF insertion status (1 = inserted, 0 = NOT inserted)
SSPB Current	{aaS4}	Returns {aaS4bbb} where:
(option V ONLY)		• bbb = SSPB current, range 000 to 250 (0 to 2500 mA)

C) Commands

Table 1.3 lists the commands for the 2015-24 and briefly describes them. After a command is sent the 2015-24 sends a return ">" indicating the command has been received and executed.

General Command Format - The general command format is {aaCND...}, where:

{ = start byte
aa = Address (**RS-485 only**)
C = 1 character, either C (command) or S (status)
N = 1 character command of status request
D = 1 character or more of data (depends on command)
} = stop byte

*** PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.**

Table 1.2 2015-24 Commands		
Command	**Syntax***	**Description**
Set Transmitter Frequency	{aaC1xxxxxxx}	where:
		4 characters - standard (7 characters - Option-X)
		• Range: 0950000 to 2150000 kHz
Set Input Level	{aaClxx}	where:
		• xx = 2 characters
		• Range: 10 to 40 (-10 to -40 dBm, in 1 dB steps)
Set Transmit Gain	{aaC3xxx}	where:
		• xxx = 3 characters (0 to 30dB), 3 characters (-10 to -1dB)
		• Range: -10 to 30 (-10 dB to +30 dB, in 1 dB steps)
Enable 10MHz RF Insertion	{aaC5x}	where x =:
(option E ONLY)		• 0 to disable 10MHz RF insertion
		• 1 to enable 10MHz RF insertion
Enable Tx	{aaCAx}	where x =:
		• 0 to disable (mute) Tx signal
		• 1 to enable Tx signal
Enable External 10MHz	{aaCEx}	where x =:
(option E ONLY)		• 0 to disable External 10MHz ref signal
		• 1 to enable External 10MHz ref signal
Enable Remote	#	Just # sign
Disable Remote	{aaCR0}	{CR and zero}

1.4 Environmental Use Information

A. **Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.

B. **Mechanical Loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.

C. **Elevated Operating Ambient Temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

D. **Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between unit may be required.

E. **Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used when addressing this concern.

F. **Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).

G. **Top Cover** - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw MUST BE REINSTALLED prior to Top Cover screw replacement. FAILURE TO DO this may cause INGRESS and/or EGRESS emission problems.

2.0 Installation

2.1 Mechanical

The 2015-24 consists of one RF/Controller PCB which is housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching, ± 12, +24, +5 VDC power supply provides power for the assembly. The 2015-24 can be secured to a rack using the 4 holes on the front panel. Figure 2.1 shows how the 2015-24 is assembled.

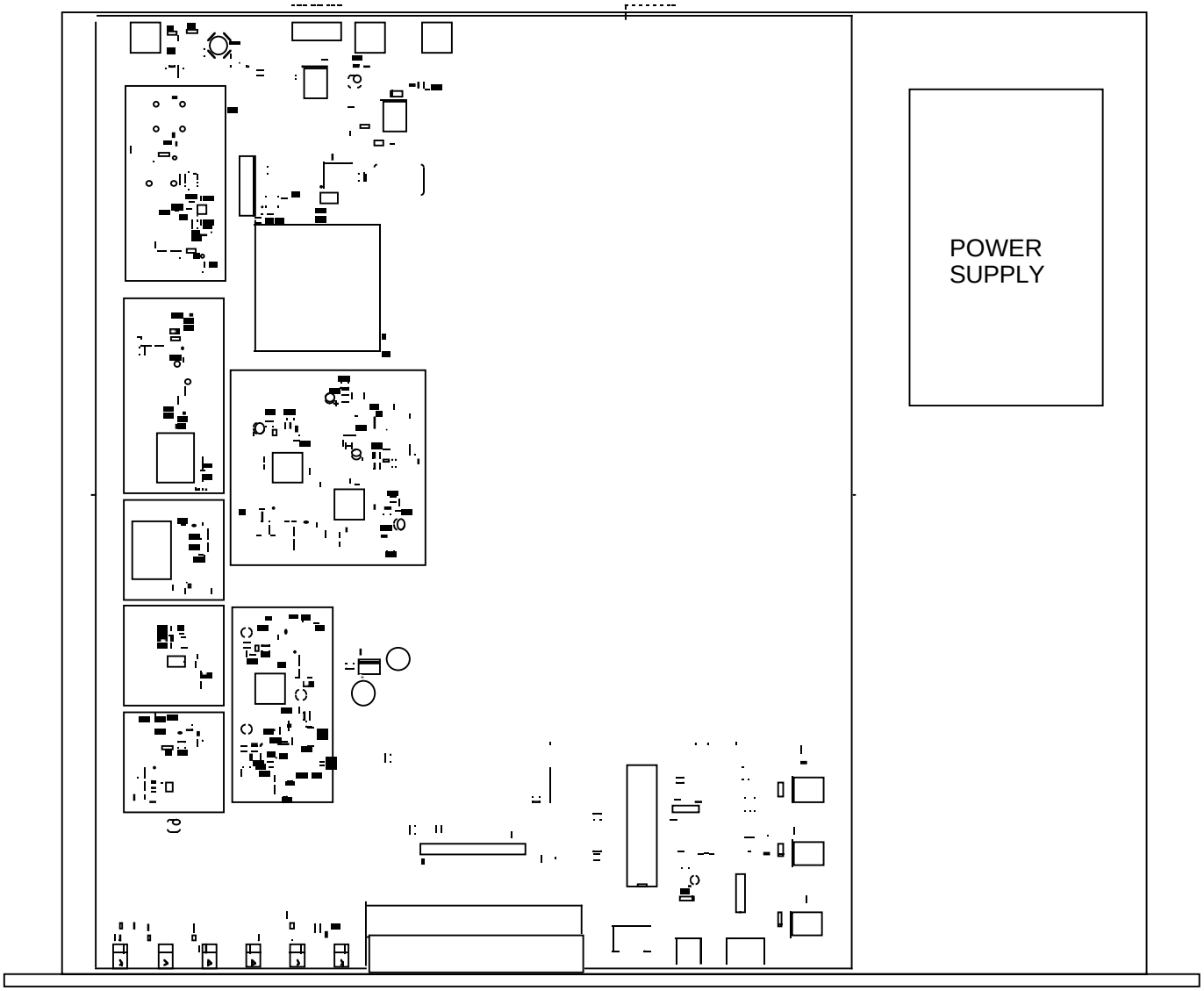


FIGURE 2.1 2015-24 Mechanical Assembly

2.2 Rear Panel Input / Output Signals

Figure 2.2 shows the input and output connectors on the rear panel.

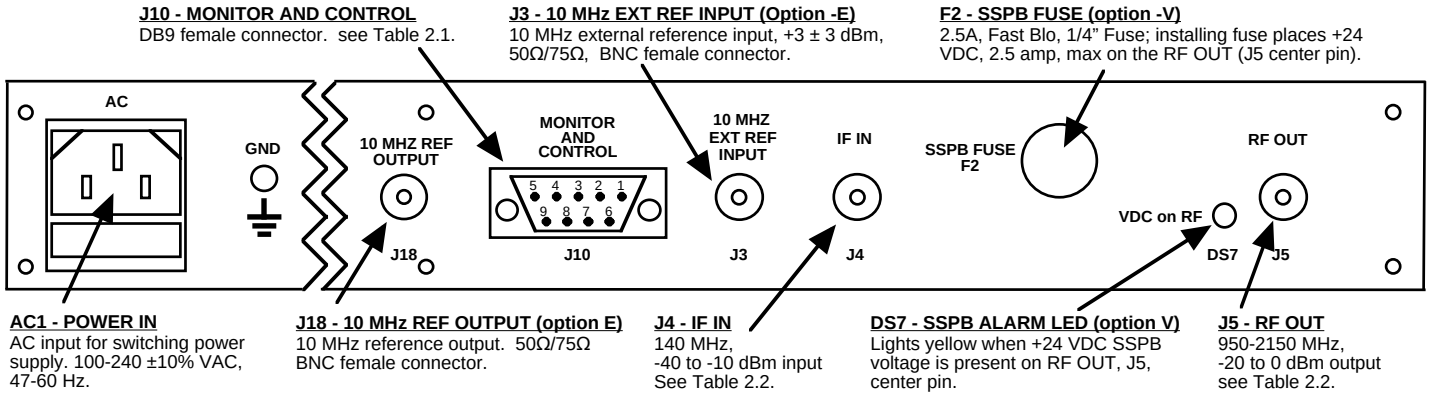

J10 - MONITOR AND CONTROL
DB9 female connector. see Table 2.1.
J3 - 10 MHz EXT REF INPUT (Option -E)
10 MHz external reference input, +3 ± 3 dBm, 50Ω/75Ω, BNC female connector.
F2 - SSPB FUSE (option -V)
2.5A, Fast Blo, 1/4" Fuse; installing fuse places +24 VDC, 2.5 amp, max on the RF OUT (J5 center pin).
AC
GND
10 MHZ REF OUTPUT
J18
MONITOR AND CONTROL
5 4 3 2 1
9 8 7 6
J10
10 MHZ EXT REF INPUT
J3
IF IN
J4
SSPB FUSE F2
VDC on RF
DS7
RF OUT
J5
AC1 - POWER IN
AC input for switching power supply. 100-240 ±10% VAC, 47-60 Hz.
J18 - 10 MHz REF OUTPUT (option E)
10 MHz reference output. 50Ω/75Ω BNC female connector.
J4 - IF IN
140 MHz, -40 to -10 dBm input See Table 2.2.
DS7 - SSPB ALARM LED (option V)
Lights yellow when +24 VDC SSPB voltage is present on RF OUT, J5, center pin.
J5 - RF OUT
950-2150 MHz, -20 to 0 dBm output see Table 2.2.

FIGURE 2.2 Rear Panel Inputs and Outputs

Table 2.1 J10 Pinouts (RS485/RS-232C)*

Pin	Description
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	Ground
6	Alarm Relay - Common
7	Alarm Relay - Normally Open
8	Not Used
9	Alarm Relay - Normally Closed

Table 2.2 IF/RF Connector Options

Option	IF	RF
STD	BNC, 75Ω	Type F, 50Ω
B	BNC, 75Ω	BNC, 75Ω
C	BNC, 75Ω	BNC, 50Ω
D	BNC, 50Ω	BNC, 50Ω
N	BNC, 75Ω	Type N, 50Ω
M	BNC, 50Ω	Type N, 50Ω
S	BNC, 50Ω	SMA, 50Ω

* Interface: DB-9 Female;
Protocol: RS485, RS422, or RS232C (selectable),
9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit

2.3 Front Panel Controls and Indicators

Figure 2.3 shows the front panel controls and indicators.

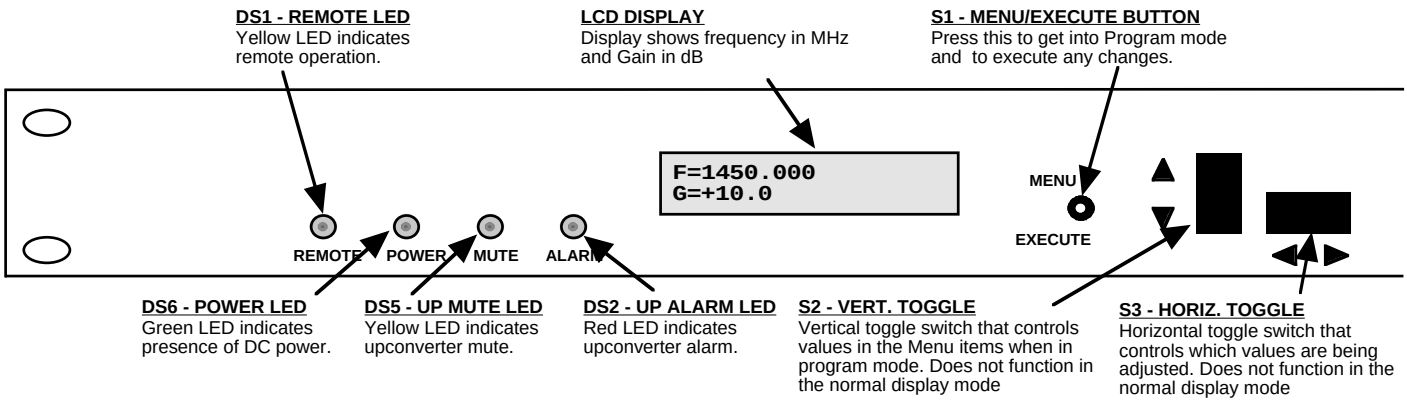

DS1 - REMOTE LED
Yellow LED indicates remote operation.
LCD DISPLAY
Display shows frequency in MHz and Gain in dB
S1 - MENU/EXECUTE BUTTON
Press this to get into Program mode and to execute any changes.
F=1450.000
G=+10.0
MENU
EXECUTE
REMOTE
POWER
MUTE
ALARM
DS6 - POWER LED
Green LED indicates presence of DC power.
DS5 - UP MUTE LED
Yellow LED indicates upconverter mute.
DS2 - UP ALARM LED
Red LED indicates upconverter alarm.
S2 - VERT. TOGGLE
Vertical toggle switch that controls values in the Menu items when in program mode. Does not function in the normal display mode
S3 - HORIZ. TOGGLE
Horizontal toggle switch that controls which values are being adjusted. Does not function in the normal display mode

FIGURE 2.3 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2015-24 Upconverter

1. Connect a -40 dBm to -10 dBm, 140 MHz signal to IF IN, J4 (Figure 2.2)
2. Connect the RF OUT, J5, to the external equipment.
3. Connect 100-240 ±10% VAC, 47 - 63 Hz to AC input on the back panel.
4. Set the desired output frequency (See Section 2.5 Menu Settings).
5. Set the input level (See Section 2.5 Menu Settings).
6. Set the gain for -10 to +30 dB. Make sure the output stays within -20 to 0 dBm with the gain selected and the input level provided. The firmware will prevent setting gain and input level outside this range. (See Section 2.5 Menu Settings).
7. Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.3).
8. Option V ONLY - To insert SSPB +24 VDC on the RF center pin install 2.5A fast blo fuse (included) in F2 and check that DS7 lights yellow (Figure 2.1).
9. AC Fuse - The AC fuse is a 5 mm X 20 mm, 2 amp slow blow (Type T) and is inserted in the far slot in the drawer below the AC input as shown in Figure 2.4. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

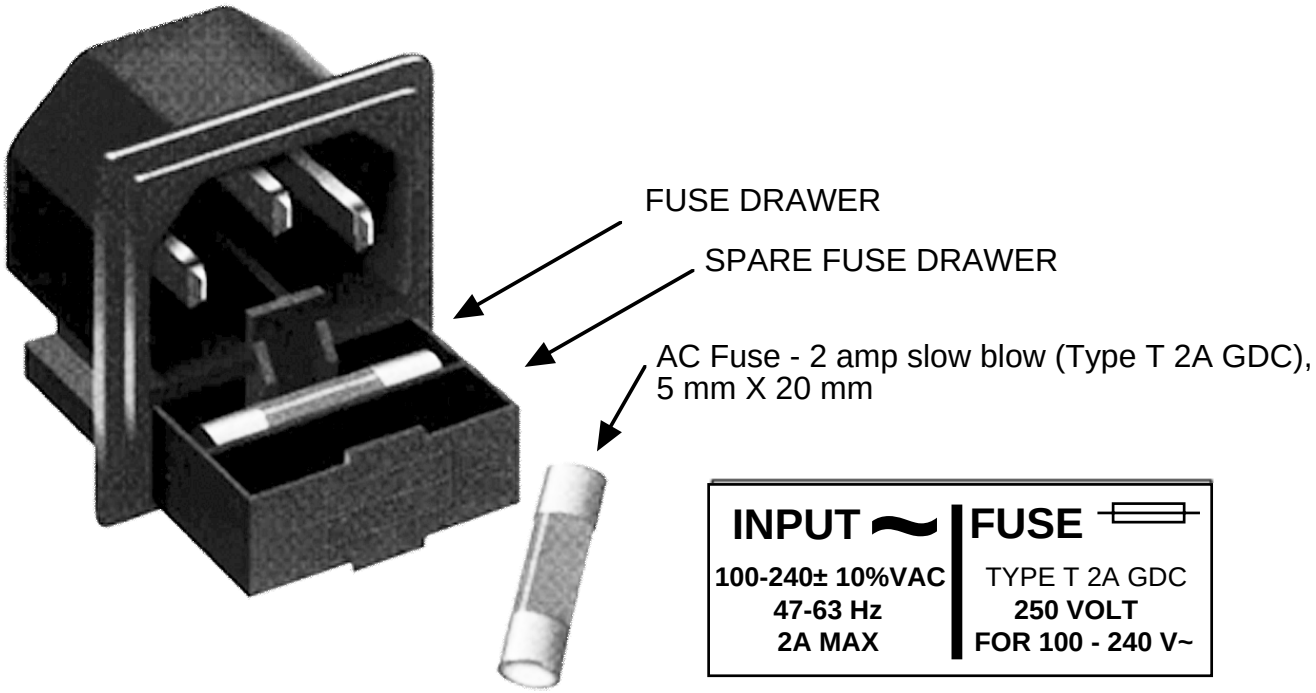


FIGURE 2.4 Fuse Location and Spare Fuse

2.5 Menu Settings

2.5.1 Functions - This section describes operation of the front panel controls. There are three operator switches, the LCD display and alarm indicator LEDs. All functions for the equipment are controlled by these components. The functions are (see Figure 2.5):

Power Up
Normal Display

Menu 1	Frequency in MHz
Menu 2	Input Level in dBm (-40 to -10)
Menu 3	Gain in dB (0 to +20)
Menu 4	Mute TX Signal
Menu 5	Set Unit to Remote Operation
Menu 6	Select Frequency Step Size (1kHz, 10kHz, 100kHz, or 125kHz)
Menu 7	Select External 10 MHz Reference (option E)
Menu 8	Select 10 MHz Reference Insertion (option E)
Menu 9	Set Remote Mode (option Q)
Menu 10	Set RS485 Remote Address for Unit (option Q)
Menu 11	View SSPB Current (option V)

Save Menu When go to end

Alarm indications appear on the LEDs (see figure 2.2).

All program changes must start with the operation of the Menu/Execute switch and must also end with the operation of the Menu/Execute switch verified by the "Save Settings?" Menu. If this sequence is not followed, none of the changes will take effect. If programming is initiated and no operator action takes place for approximately 12 seconds (before the final press of the Menu/Execute switch) the display will revert to its previous status and you will need to start over.

2.5.2. Power On Settings

NOTE: The last status of a unit is retained even when power is removed. When power is restored, the unit will return to it's previous settings.

When power is first applied, the LCD display goes through three steps.

1.The LCD goes black to show all segments are functioning.

2.The software version will be displayed.

```
REV 1.00
```

3.The present frequency, gain, and selected RF output of the upconverter is shown.

```
F = 1450.000
G = +10.0
```

The unit is now operational and ready for any changes the operator may desire.

2.5.3 Control Switches

1. Menu/Execute - Any change to the programming of the unit must be initiated by pressing the Menu/Execute switch and completed by pressing the Menu/Execute switch.
2. Horizontal Switch - This switch is mounted so its movement is horizontal and moves the cursor left or right.
3. Vertical Switch - This switch is mounted so its movement is vertical and has two functions:
   - **A)** During frequency, gain changes, the vertical movement will raise or lower the number in the direction of the arrows.
   - **B)** For other functions such Mute on/off, the vertical switch will alternately turn the function on or off regardless of the direction operated.

2.5.4 Frequency Changes

At any time during the modification process, if you have made a mistake and do not wish to save the changes you have made, **do not press the Menu/Execute switch**; simply do nothing for approximately 12 seconds, and the system will return to the normal operating mode or scroll to **"R"** and push the menu/Execute switch and select **"NO"** in the **"SAVE SETTINGS?"** window.

To change the FREQUENCY:

1.Operate the Menu/Execute switch until you get to the menu item you want to change see Figure 2.5 for the sequence of menu options. The following display is for changing the upconverter frequency:

```
F = 1450.000          R
```

Pressing the Up/Down switch down will toggle the display to:

```
F = 1550.000          R
```

By using the horizontal rocker switch the cursor can be moved left or right .

```
F = 1450.000          R
```

NOTE: CHANGES DO NOT TAKE PLACE ON FREQUENCY UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES. THE CARRIER IS MUTED WHEN FREQUENCY IS CHANGED.

When the display indicates the value desired you can push the Menu/Execute switch to the next item:

```
UP INLVL = -20        R
```

OR you can scroll to "R", push the Menu/Execute switch to get to:

```
SAVE SETTINGS?     Y N
```

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.
Pushing the Menu/Execute switch then takes you to the default display:

```
F = 1550.000
G = +10.0
```

Figure 2.5 shows all the menu items and how to make changes.

2.5.5 Gain Changes

When you get to this menu note that the gain changes will be made as you make them but if you do not wish to save the changes you have made, scroll to **"R"** and push the menu/Execute switch and select **"NO"** in the **"SAVE SETTINGS?"** window or **do not press the Menu/Execute switch**; simply do nothing for approximately 12 seconds, and the system will return to the normal operating mode.

To change the GAIN, first push the Menu/Execute switch to get to the gain setting:

Operate the Menu/Execute switch until you get to the menu item you want to change (see Figure 2.5 for the sequence of menu options). The following display is for changing the upconverter input level. This is an important setting to optimize spurious and should be made as accurately as possible:

```
UP INLVL = -20      R
```

NOTE: CHANGES TAKE PLACE ON LEVEL AND GAIN IMMEDIATELY BUT DO NOT GET SAVED UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES.

Press the Up/Down switch to change the level in 1 dB steps and then push the Menu/Execute switch to get to the Gain setting:

```
G = +10.0           R
```

Press the Up/Down switch to change the gain in 0.1, 1 or 10 dB steps:

```
G = +20.0           R
```

By using the horizontal rocker switch the cursor can be moved left or right. Pressing the Up/Down switch down will toggle the display digit selected until you have the desired gain.

NOTE: THE GAIN WILL BE CHANGED AS YOU ADJUST THE NUMBERS. HOWEVER, THE VALUE WILL NOT BE STORED UNTIL YOU INDICATE YES IN THE SAVE SETTINGS WINDOW. DO NOT SET A GAIN THAT WOULD EXCEED 0 dBm OR HAVE LESS THAN -20 dBm OUTPUT LEVEL. THE FIRMWARE PREVENTS YOU FROM THIS.

When the display indicates the value desired you can push the Menu/Execute switch to the next item OR you can scroll to "R", push the Menu/Execute switch to get to:

```
SAVE SETTINGS?    Y N
```

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.
Pushing the Menu/Execute switch then takes you to:

```
F = 1550.000
G = +20.0
```

Figure 2.5 gives the menu items and how to make changes

2.5.5 Alarm Indications

An alarm condition for will occur if the local oscillator phase lock loop (PLL) comes out of lock. The Mute LED will light if you select to mute the Tx Signal and the Remote LED will light when you select the Remote mode.

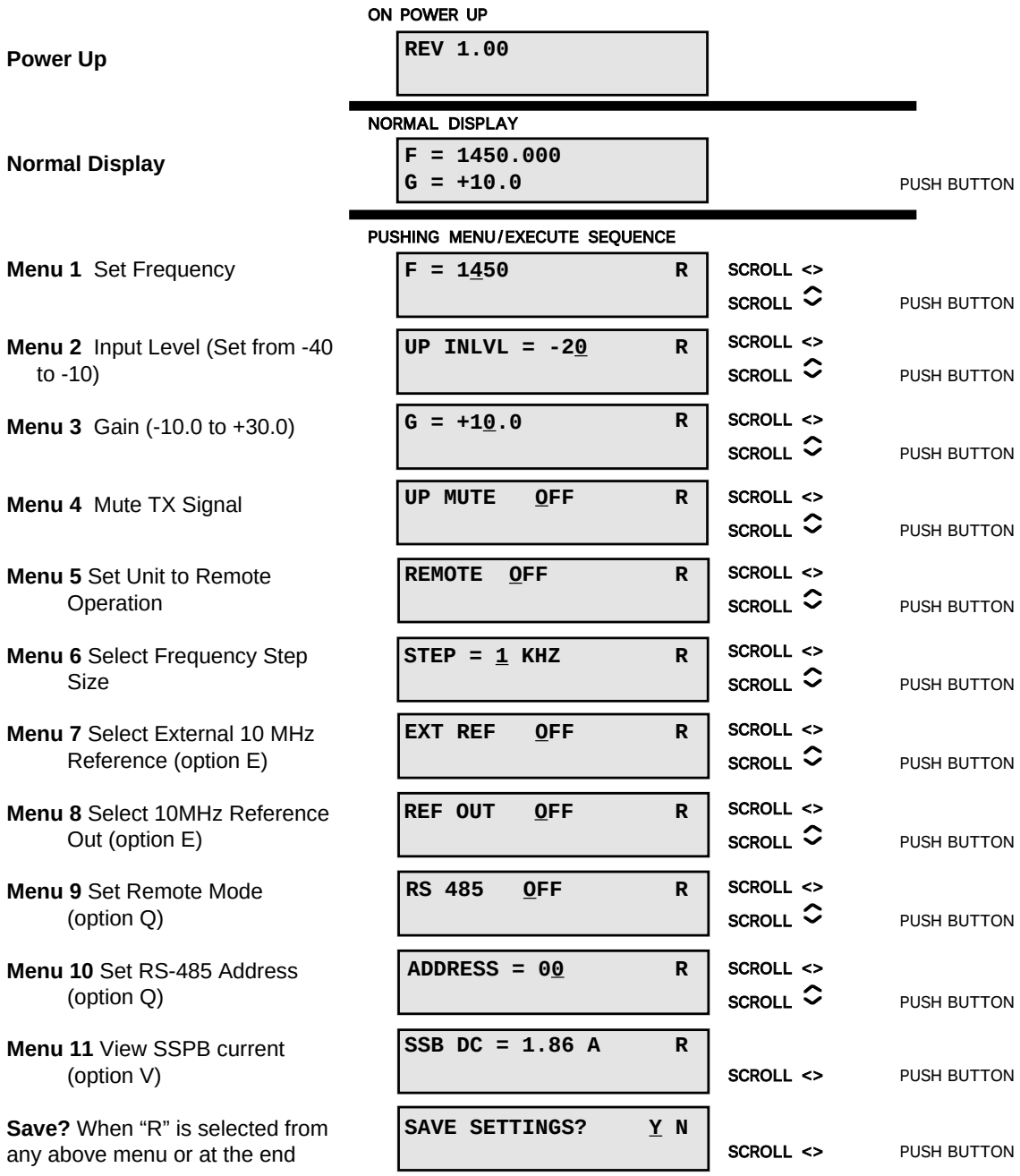


FIGURE 2.5 Menu Display and Sequence

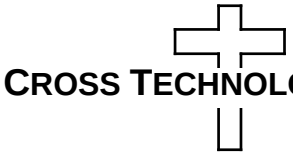
2.6 Available Options (Models: 2015-XX, 2016-XX & 2017-XX)

Table 2.6.A Options Document

Option	Available Product(s)	Option Description
AGC	2016-XX	Provides Automatic Gain Control (AGC) capability on 70 MHz Output on 2016-XX IF Downconverter.
AGC/2	2015-XX 2016-XX	Provides Automatic Gain Control (AGC) capability for 50 to 200 MHz Output via an add-on PCB On-board SMA connectors allow insertion of bandpass filters (Option BPF-#) if required.
B	2015-XX 2016-XX	Connectors: All RF & IF Connectors, 75 Ohm BNC, (2015-XX & 2016-XX).
BPF-1	2015-XX 2016-XX	Bandpass Filter Option #1, highly selective elliptic function bandpass filter with multiple all pass delay equalizers.
C	2015-XX 2016-XX	Connectors, IF - 75 Ohm BNC, RF - 50 Ohm BNC for 2015-XX & 2016-XX Frequency Converters.
CE-Cert	2015-XX 2016-XX 2017-XX	CE Certification Compliance, Documentation & Labeling for 2015-XX, 2016-XX and 2017-XX frequency converters and 2115-XX & 2116-XX block converters.
D	2015-XX 2016-XX	All RF & IF Connectors, 50 Ohm BNC, 2015-XX & 2016-XX.
E	2015-XX 2016-XX	External 10 MHz reference input, also supports insertion of either internal or external 10 MHz source on RF, models 2015-XX & 2016-XX Up & Downconverters.
E/2	2015-XX 2016-XX	External 10 MHz reference input for IF to UHF-, S-, C-, Ku- Agile Frequency Converters.
F	2015-XX 2016-XX	Connectors, 75 F-type RF, 75 F-type IF, for 2015-XX & 2016-XX Frequency Converters.
H	2015-XX 2016-XX 2017-XX	High Stability (± 0.01 ppm) internal reference, for 2015 , 2106, & 2017-XX frequency converters and 2083-714A/-914A IF Translators.
I	2015-XX 2016-XX	Spectrum Inversion for 2015-XX Upconverters or 2115-XX Block Upconverters.
J	2015-XX 2016-XX	Connectors, 75 F-type RF, 50 Ohm BNC IF, for 2015 & 2016-XX Frequency Converters.
K	2015-XX 2016-XX	Connectors, 75 BNC RF, 50 Ohm BNC IF, for 2015 & 2016-XX Frequency Converters.
L	2015-XX 2016-XX	LNB Voltage + 24 VDC, 0.4 Amps, for 2016-XX Downconverter.
M	2015-XX 2016-XX	Connectors: N-type, 50 Ohm RF & BNC 50 Ohm IF; 2015 & 2016-XX Frequency Converters.
N	2015-XX 2016-XX	Connectors: N-type, 50 Ohm RF & BNC 75 Ohm IF; 2015 & 2016-XX Frequency Converters.
NF	2015-XX 2016-XX	Connectors: RF = N/50 Ohm , IF = F/75 Ohm, for 2015 & 2016-XX Frequency Converters.
O	2015-XX 2016-XX 2017-XXX	10 MHz Reference Adjust Feature.
P24	2015-XX 2016-XX	Option P24 – ±24 VDC Power Supply, for 2015, 2016, & 2017-XX Frequency Converters; and 2115-XX & 2016-XX Block Converters.
P48	2015-XX 2016-XX	Option P48 – ±48 VDC Power Supply, for 2015, 2016 & 2017 Frequency Converters; 2115-XX & 2016-XX Block Converters.

Table 2.6.B *Options Document - Continued*		
Option	**Available Product(s)**	**Option Description**
PWR	2015-XX 2016-XX	Option PWR - Provides +15 dB Output @ 1dB Compression for 2015-XX L-band Upconverter 50 Ohm Connectors ONLY.
Q	2015-XX 2016-XX 2017-XX	RS485/RS422 Remote Interface, for 2017-XX Frequency converters.
Q/2	2015-XX 2016-XX 2017-XX	RS485/RS422 Remote Interface, for 2015, 2016, & 2017-XX Frequency converters.
R	2015-XX 2016-XX 2017-XX	Redundant Power Supply, for 2015, 2016 & 2017-XX Frequency Converters. NOT AVAILABLE on units with SSPB Power Option (Option V).
S	2015-XX 2016-XX	Connectors: RF = all SMA, 50 Ohm , IF = all BNC 50 Ohm; 2115-XX & 2116-XX Frequency Converters.
S7	2015-XX 2016-XX	Connectors: RF - SMA 50 Ohm; IF BNC 75 Ohm for 2015 & 2016 Up or Downconverters OR 2115-XX and 2116-XX BLOCK Up or Downconverters.
SP	2015-XX 2016-XX	Integrated 2 x 1 splitter to provide dual, simultaneous IF Outputs.
SS	2015-XX 2016-XX	Connectors: RF=SMA/50 Ohm, IF=SMA/50 Ohm for ALL L-, C-, and Ku-band Frequency Converters.
SW	2015-XX 2016-XX	Integrated RF Switch with Remote RS485/RS522 control to enable remote switching of RF Output from RF A to RF B Outputs.
SW1	2015-XX 2016-XX	Integrated RF Switch, designed to switch between Low and High RF Inputs based on selected RF Frequency from Front Panel LCD menu or Remote M&C interface.
T	2015-XX 2016-XX 2017-XX	Temperature Sensor, for 2017-XX Up/Downconverter.
V41	2015-XX 2016-XX 2017-XX	SSPB Voltage, +48 VDC. 2.10 Amps, 100 Watts, for 2015-XX Upconverters.
V46	2015-XX 2016-XX	SSPB Voltage, +48 VDC. 1.25 Amps, 65 Watts, for 2015-XX Upconverters.
W1	2015-XX 2016-XX	Level Detection for 2016-25 Downconverter.
W4	2015-XX 2016-XX	3 MHz bandwidth SAW Filter for 2015 & 2016-XX Up or Downconverters.
W5	2015-XX 2016-XX	Optional Reference Oscillator Adjustment, rear panel, screw adjust for 2015 & 2016-XX Up or Downconverters.
W7	2015-XX 2016-XX	Front Panel, RF & IF Test/Monitor Ports for 2015 & 2016-XX Up or Downconverters; Connectors RF - SMA 50 Ohms, IF - BNC 50 Ohms.
W8	2015-XX 2016-XX 2017-XX	Ethernet M & C Remote Interface, for 2015, 2016, & 2017-XX Frequency converters.

Table 2.6.C *Options Document*		
Option	**Available Product(s)**	**Option Description**
W10	2015-XX 2016-XX 2017-XX	Front Panel Disable for Series 2015/2016 & 2017-XX Frequency Converters. Provides the ability to Disable the Front Panel Interface via the Remote Interface and to ONLY configure, monitor and control the unit via the Remote Interface.
W12	2015-XX 2016-XX	REAR Panel, LO1 (SMA Connector) and LO2 (BNC Connector) Test Ports for 2015-XX Upconverters.
W13	2015-XX 2016-XX	REAR Panel, LO1 (SMA Connector) Test Port for 2016-XX Downconverters.
W15	2015-XX 2016-XX 2017-XX	Power ON/OFF Switch, Rear Panel Mounted. 2015, 2016, & 2017 L-band Frequency Converters.
W16	2015-XX 2016-XX 2017-XX	Individual Test Data per unit. For Frequency Converters and/or Protection Switches.
W17	2015-XX 2016-XX	Front Panel, IF Test/Monitor Ports for 2015-XX Upconverters w/25 dB Gain, Max Output +5 dBm; Connector IF - BNC 50 Ohms.
W18	2015-XX 2016-XX	Enhanced P1 dB Output power; +5 dBm.
X/X1	2015-XX 2016-XX 2017-XX	Option X - 125 KHz Step Size for 2015-XX/2016 -XX/2017-XX L-band Frequency Converters Option X1 - 100 KHz Step Size for 2015-XX/2016 -XX/2017-XX L-band Frequency Converters
Z	2015-XX 2016-XX	Upconverter Attenuator 0.1 dB, on 2015-XX Upconverter or 2017-XX Upconverter portion.
Z1	2015-XX 2016-XX	Downconverter Attenuator 0.1 dB, on 2016-XX Downconverter or 2017-XX, Downconverter portion.
-5,	2015-XX	500 KHz Frequency Step for 2015-25 Upconverter.



CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com